WHAT IS CLAIMED IS:

1. A micro magnetic latching device, comprising:

a substrate;

a moveable element supported by said substrate and having a magnetic material and a long axis;

first and second magnets that produce a first magnetic field, which induces a magnetization in said magnetic material, said magnetization characterized by a magnetization vector pointing in a direction along said long axis of said moveable element, wherein said first magnetic field is approximately perpendicular to a major central portion of said long axis; and

a coil that produces a second magnetic field to switch said movable element between two stable states, wherein only temporary application of said second magnetic field is required to change direction of said magnetization vector thereby causing said movable element to switch between said two stable states.

2. The device of claim 1, wherein said first magnet is a permanent magnet that is substantially planar and substantially parallel to said substrate.

3. The device of claim 1, wherein said first and said second magnets are permanent magnets that are substantially planar and substantially parallel to said substrate, and wherein said moveable element and said substrate are located between said first and said second magnets.

4. The device of claim 2, wherein said second magnet is a permalloy layer that is substantially planar and substantially parallel to said substrate.

5. The device of claim 4, wherein said permalloy layer is located between said substrate and said movable element.

6. The device of claim 4, wherein said permalloy layer is located on an opposite side of said substrate from a side of said substrate that supports said movable element.

7. The device of claim 4, wherein said movable element is located between said permalloy layer and said substrate, and said permanent magnet is located on an opposite side of said substrate from a side of said substrate that supports said movable element.

8. The device of claim 5, wherein said permanent magnet is located on an opposite side of said substrate from a side of said substrate that supports said movable element.

9. The device of claim 5, further comprising a second permalloy layer located on an opposite side of said substrate from a side of said substrate that supports said movable element.

10. The device of claim 5, wherein said movable element is located between said permalloy layer and said permanent magnet.

11. The device of claim 6, wherein said movable element is located between said substrate and said permanent magnet.

12. The device of claim 11, further comprising a second permalloy layer located between said permanent magnet and said moveable element.

13. The device of claim 11, further comprising a second permalloy layer located on an outer side of said permanent magnet.

14. The device of claim 3, wherein said substrate comprises raised structures that support said moveable element.

15. The device of claim 14, further comprising a pair of ground planes that sandwich said moveable element.

16. The device of claim 6, wherein said permalloy layer comprises alternating discrete sections of soft magnetic material and sections of non-magnetic material, wherein said alternating sections are located along said long axis.

17. The device of claim 9, wherein said second permalloy layer comprises alternating discrete sections of soft magnetic material and sections of non-magnetic material, wherein said alternating sections are located along said long axis.

18. The device of claim 3, further comprising a plurality of moveable elements supported by said substrate.

19. The device of claim 8, further comprising a plurality of moveable elements supported by said substrate.

20. The device of claim 8, further comprising a plurality of moveable elements supported by said substrate, and wherein said permalloy layer comprises a plurality of laterally spaced sections, individual ones of said laterally spaced sections being in relaxed alignment with a corresponding one of said plurality of moveable elements.

21. The device of claim 8, further comprising a plurality of moveable elements supported by said substrate, and wherein said permanent magnet comprises a plurality of laterally spaced sections, individual ones of said laterally spaced sections being aligned with a corresponding one of said plurality of moveable elements.

22. The device of claim 8, further comprising a plurality of moveable elements supported by said substrate, and wherein said permanent magnet comprises a plurality of laterally spaced first sections, individual ones of said first sections being aligned with a corresponding one of said plurality of moveable elements, and wherein said permanent magnet comprises a plurality of laterally spaced second sections, individual ones of said second sections being in relaxed alignment with a corresponding one of said plurality of moveable elements.

23. The device of claim 10, further comprising a plurality of moveable elements supported by said substrate.

24. The device of claim 10, further comprising a plurality of moveable elements supported by said substrate, and wherein said permalloy layer comprises a plurality of laterally spaced sections, individual ones of said sections being in relaxed alignment with a corresponding one of said plurality of moveable elements.

25. The device of claim 10, further comprising a plurality of moveable elements supported by said substrate, and wherein said permanent magnet comprises a plurality of laterally spaced sections, individual ones of said sections being in relaxed alignment with a corresponding one of said plurality of moveable elements.

26. The device of claim 10, further comprising a plurality of moveable elements supported by said substrate, and wherein said permanent magnet comprises a plurality of laterally spaced first sections, individual ones of said first sections being in relaxed alignment with a corresponding one of said plurality of moveable elements, and wherein said permanent magnet comprises a plurality of laterally spaced second sections, individual ones of said second sections being in relaxed alignment with a corresponding one of said plurality of moveable elements.

27. The device of claim 1, wherein said coil comprises an "S-shaped" configuration.

28. The device of claim 1, wherein said coil comprises an a single coil line.

29. The device of claim 1, wherein said magnetic material comprises a permalloy.

30. The device of claim 31, wherein said permalloy comprises a plurality of strips on said moveable element and aligned parallel to said long axis.

31. The device of claim 1, wherein said first and second magnets are permanent magnets that are located on said substrate, and said moveable element is located between said first and second permanent magnets, each of said first and second permanent magnets having a respective long axis parallel to said long axis of said moveable element, wherein said switching between said two stable states causes said moveable element to move in a plane substantially parallel to said substrate.

32. The device of claim 4, wherein said coil is located on an opposite side of said moveable element from a side thereof that is supported by said substrate.

33. The device of claim 4, further comprising permalloy layers located perpendicular to said substrate and laterally spaced from said moveable element.

34. The device of claim 5, further comprising a buffer layer located between said permalloy layer and said substrate.

35. The device of claim 8, wherein said magnetic material comprises a permalloy having a reflective layer thereon, wherein said device functions as an optical switch when light impinges on said reflective layer such that switching said movable element between said two stable states causes said impinging light to be reflected in one of at least two different directions.

36. The device of claim 10, wherein said magnetic material comprises permalloy having a reflective layer thereon, and said permanent magnet having a slit located proximate to said reflective layer, wherein said device functions as an optical switch when light passed through said slit and impinges said reflective layer such that switching said movable element between said two stable states causes said impinging light to be reflected in one of at least two different directions back through said slit.

37. A micro magnetic latching device, comprising:

a substrate;

a moveable element supported by said substrate and having a magnetic material and a long axis;

a cylindrical magnet, having a center axis, that laterally encloses said moveable element such that said center axis passes through a central portion of said moveable element and is perpendicular to said substrate, wherein said cylindrical magnet produces a first magnetic field that induces a magnetization in said magnetic material, said magnetization characterized by a vector pointing in a direction along said long axis of said moveable element, wherein said first magnetic field is approximately perpendicular to a major central portion of said long axis; and

a coil that produces a second magnetic field to switch said movable element between two stable states, wherein only temporary application of said second magnetic field is required to change direction of said magnetization vector thereby causing said movable element to switch between said two stable states.

38. The device of claim 37, further comprising a first permalloy layer located on an opposite side of said substrate from a side of said substrate that supports said movable element, and a second permalloy layer located on an opposite side of said moveable element from a side thereof that is supported by said substrate.